



A.D. 1849 N^o 12,797.

S P E C I F I C A T I O N

OF

JOSEPH JOHNSON AND JOE CLIFFE.

FURNACES, &c.

L O N D O N :

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY :

PUBLISHED AT THE GREAT SEAL PATENT OFFICE,

25, SOUTHAMPTON BUILDINGS, HOLBORN.

4d. 1s. 9d.

1854.



A.D. 1849 N° 12,797.

Furnaces, &c.

JOHNSON AND CLIFFE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, JOSEPH JOHNSON, of Huddersfield, in the County of York, Bricklayer, and JOE CLIFFE, of the same place, Ironfounder, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her
5 Royal Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Twelfth day of October, in the thirteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said Joseph Johnson and Joe Cliffe, Her especial license, full power, sole privilege and authority, that we, the said Joseph Johnson and Joe Cliffe, our
10 exors, admors, and assigns, and such others as we, the said Joseph Johnson and Joe Cliffe, our exors, admors, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, and in all
15 Her Majesty's Colonies and Plantations abroad, and in the Islands of Jersey, Guernsey, Alderney, Sark, and Man, our Invention of "IMPROVEMENTS IN FURNACES, OR IN THE MEANS OF CONSUMING SMOKE;" in which said Letters Patent is contained a proviso obliging us, the said Joseph Johnson and Joe Cliffe, by an instrument in writing under our hands and seals, or under the hand and
20 seal of one of us, particularly to describe and ascertain the nature of our said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in Her Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had,
25 will more fully and at large appear.

Johnson & Cliffe's Impts. in Furnaces, or in the Means of Consuming Smoke.

NOW KNOW YE, that in compliance with the said proviso, we, the said Joseph Johnson and Joe Cliffe, do hereby declare that the nature of our said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following description thereof, reference being had to the Drawings hereunto annexed, and to the letters and 5 figures marked thereon, (that is to say :—

Our Invention of improvements in furnaces or in the means of consuming smoke, consists of an improved mode of constructing furnaces or fire-places, whereby heated atmospheric air may be admitted to the combustible gases given off during the combustion of the fuel in the fire-place, and allowed to 10 become intimately mixed with such combustible gases for the purpose of burning or consuming them, thereby preventing the formation of smoke and greatly economizing the fuel, a considerable portion of the valuable parts of which would otherwise escape by the flue and be discharged into the atmosphere either in the form of dense smoke or valuable combustible gases, which would 15 then become lost. Various plans have heretofore been devised for admitting either heated or cold atmospheric air to the flues of furnaces, for the purpose of burning or consuming the combustible gases therein, and thereby economizing fuel and preventing the formation of smoke and the discharge of valuable combustible gases or smoke from the chimney; but such plans have not always 20 succeeded in effecting the desired object, although to a certain extent an economy of fuel has sometimes resulted from their employment. By the improvements hereafter described we have endeavored to obviate some of the objections to which the plans heretofore in use are liable, and at the same time it has been our aim to remedy such defects in as simple and economical a 25 manner as possible. In our improved furnaces the air to be mixed with the combustible gases in the flue is admitted by an aperture in front, either immediately over the fire-door or at some other part where it may be well heated, and is conducted along a pipe or pipes, passage or passages, situated close under the seating of the boiler, to a hollow arched chamber, furnished with 30 openings for the purpose of discharging the air downwards among the heated combustible gases as they pass from the fire-place to the flue; or the atmospheric air is conducted from the entrance opening (which should be furnished with a door) to an arched channel or chamber over the fire-place, where it becomes heated by the fire, and from this arched chamber the heated air passes 35 down longitudinal side channels, flues, or pipes, along which it is conducted to the interior of a hollow arch, from whence it issues in a highly heated state through openings made in the inner or under side of the arch, and, becoming mixed with the combustible gases which are passing from the fire-place into ;

Johnson & Cliffe's Impts. in Furnaces, or in the Means of Consuming Smoke.

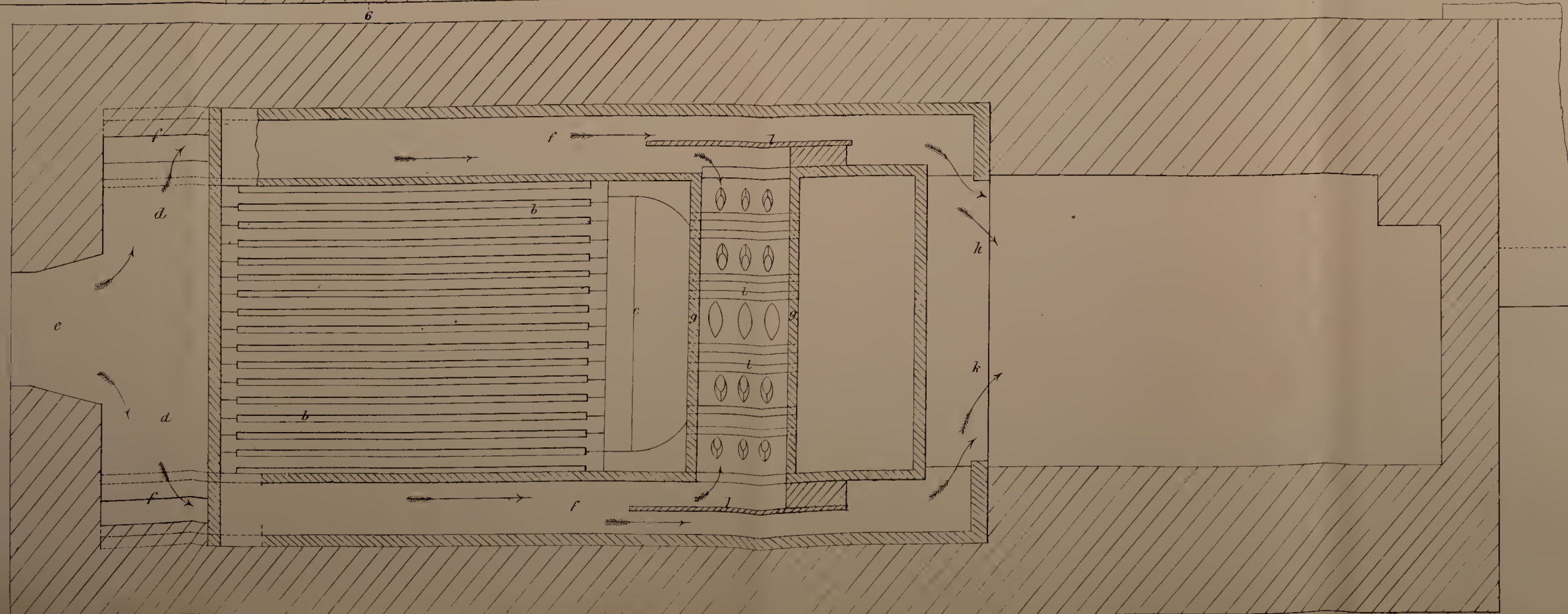
the flue, it furnishes the same with the proper supply of oxygen to effect the combustion thereof. By this means all the combustible parts of the fuel become consumed, and none but the incombustible gases pass along the flue and out at the chimney. In some cases, in order to keep up a draft and draw
5 away the incombustible gases from the flue, and also to get rid of the noxious part thereof, we make use of a fan exhauster, or jet of steam, which draws the gases from the flue and conducts them to a chamber, where they are submitted to the action of water or some other chemical agent, for the purpose of absorbing the noxious portion of them, before allowing the remaining portion
10 to escape into the atmosphere. We would observe that various plans may be devised for carrying out our improvements; but we have thought it advisable to describe such arrangements as have been found to answer in practice, premising, however, that it may be necessary to modify in some manner the arrangements herein shewn according to the circumstances of any particular
15 case and the peculiar construction of boiler to which our improvements are to be applied. In the accompanying Drawings we have shewn our improvements as applied to a large waggon boiler and also to a cylindrical boiler, both of which boilers are intended for land purposes; we have also shewn the improvements as applied to a marine boiler. Fig. 1 is a longitudinal section taken
20 through a waggon boiler and furnace, with our improvements adapted thereto. Fig. 2 is a sectional plan view taken in the line 1, 2, of Fig. 1, and shewing the arrangement of the flues. Fig. 3 is another sectional plan view taken about the line 3, 4, of Fig. 1, and shewing the air chambers, the side channels, and hollow arch for admitting heated air to the combustible gases. Fig. 4 is
25 a transverse vertical section of the boiler and hollow arch taken in the line 5, 6, of Fig. 1; and Fig. 5 is another transverse vertical section taken in the line 7, 8, of Fig. 1. A waggon boiler of the ordinary construction is seen at *a, a, a, a*, and the fire-place or furnace at *b, b*; the fire bridge at the back of the furnace is seen at *c, c*; and *d, d*, is an arched chamber situated above the
30 fire-place, and to which air is admitted from the external atmosphere by means of an opening at *e* in front of the furnace and above the fire door. This entrance to the arched chamber *d, d*, may be furnished with a door for the purpose of regulating the admission of air to the chamber *d, d*, from whence the heated air passes into the side passages *f, f*, (seen best in Figures
35 3, 4, and 5,) to the hollow arch *g, g*. This arch is constructed of hollow fire tiles or bricks, and is built up on the hollow channel *h*, which communicates with the side channels or passages *f, f*, seen best in Fig. 4, and in elevation upon an enlarged scale at Fig. 5*. The hollow channel *h* also communicates, by means of the hollow tiles or bricks *i, i, i, i*, with the hollow arch *g, g*, above.

Johnson & Cliffe's Impts. in Furnaces, or in the Means of Consuming Smoke.

The ends of this arch are also open to the side channels *f, f*, so that a perfect circulation of air may take place. The heated air from this arch *g* rushes out, as shewn by the arrows, through openings *g** made in the under side thereof, and acts upon the combustible gases that are passing from the fire-place through the spaces *j, j, j*, between the hollow fire tiles or bricks *i, i*. Upon 5 referring to Fig. 3 it will be seen that the side passages are continued beyond the hollow arch *g*, and terminate at a hollow fire bridge *k*, which they supply with heated air for the purpose of causing the same to issue into the flue, and act upon and consume such combustible gases as may have passed the arch *g, g*. This is a precaution which may be employed at the discretion of the engineer 10 or constructor, but when it is adopted it will be found advisable to divide the current of air in the side channels *f, f*, into two parts, by means of a longitudinal partition, as seen at *l* in Fig. 3. In cases where it may be thought desirable to increase the draft and purify the products of combustion, the incom- 15 bustible gases may be drawn from the flue by means of a fan or exhauster, or other means, and conducted into a chamber as at *m*, Figures 1 and 2, where the gases may be operated upon by jets of lime water or other chemical agents. Fig. 6 is a longitudinal vertical section of a cylindrical tubular boiler with our improvements adapted thereto. Fig. 7 is a horizontal section of the same; and Fig. 8 is a transverse vertical section. *a, a*, is the boiler or water space, 20 and *b, b*, the furnaces or fire-places, of which there are two, consequently all the parts connected with the smoke consuming apparatus are in duplicate. The fire bridge at the back part of the fire-place is seen at *c, c*. In this instance the atmospheric air is represented as being admitted to the hollow annular space or arch *g, g*, by means of a channel or flat pipe *e, e*, which is 25 placed along the bottom of the ash-pit. The arched chamber *d, d*, and longitudinal channels or passages *f, f*, of Figures 1, 2, 3, 4, and 5, are therefore dispensed with, and the air is heated in its passage through the channel *e* and lower part of the arch *g* before it passes out of the arch and mixes with the combustible gases. The flat pipe *e, e*, communicates with the hollow annular 30 space or arch *g*, as seen best in Fig. 8. On the under side of the upper part of this arch openings *n, n*, are made for the purpose of allowing the hot air to rush out and act upon the combustible gases, and any portion of such gases which may pass through the arch unconsumed will come in contact with a second current of heated atmospheric air which issues from the hollow fire 35 bridge *k*, which is supplied with air in a somewhat similar manner to that already described in reference to Figures 1 and 3.

In Figures 9, 10, and 11 we have shewn our improvements as applied to a marine tubular boiler. In this instance the atmospheric air is admitted to the

FIG. 5.



F I C . 8 .

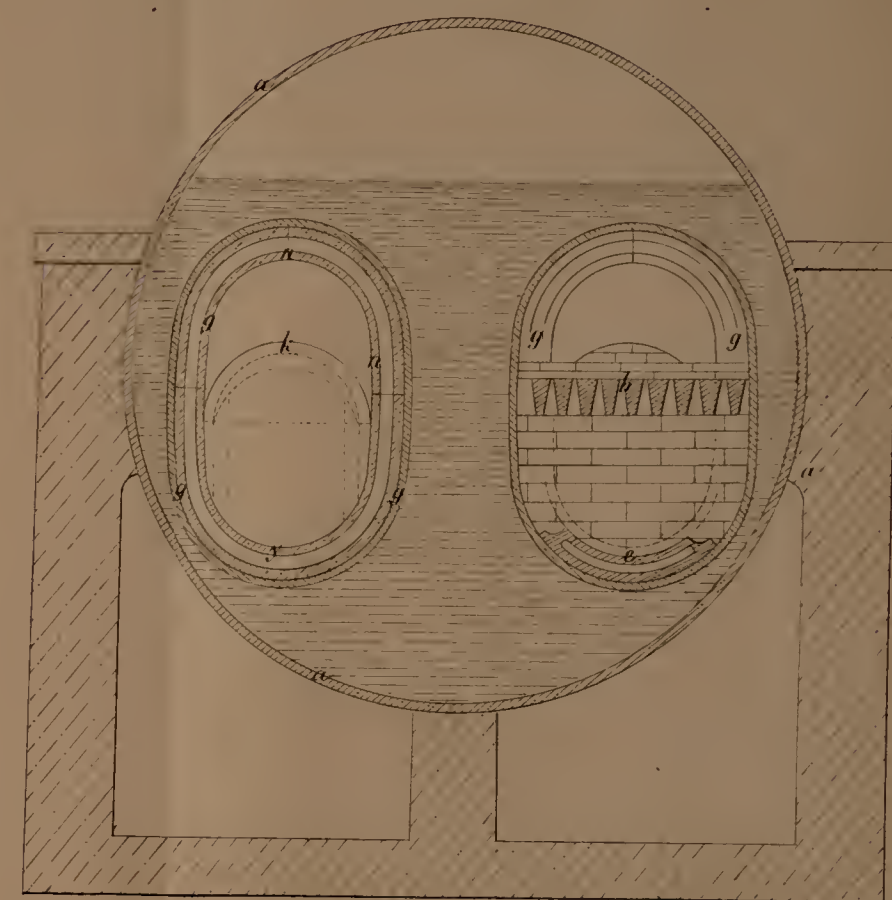
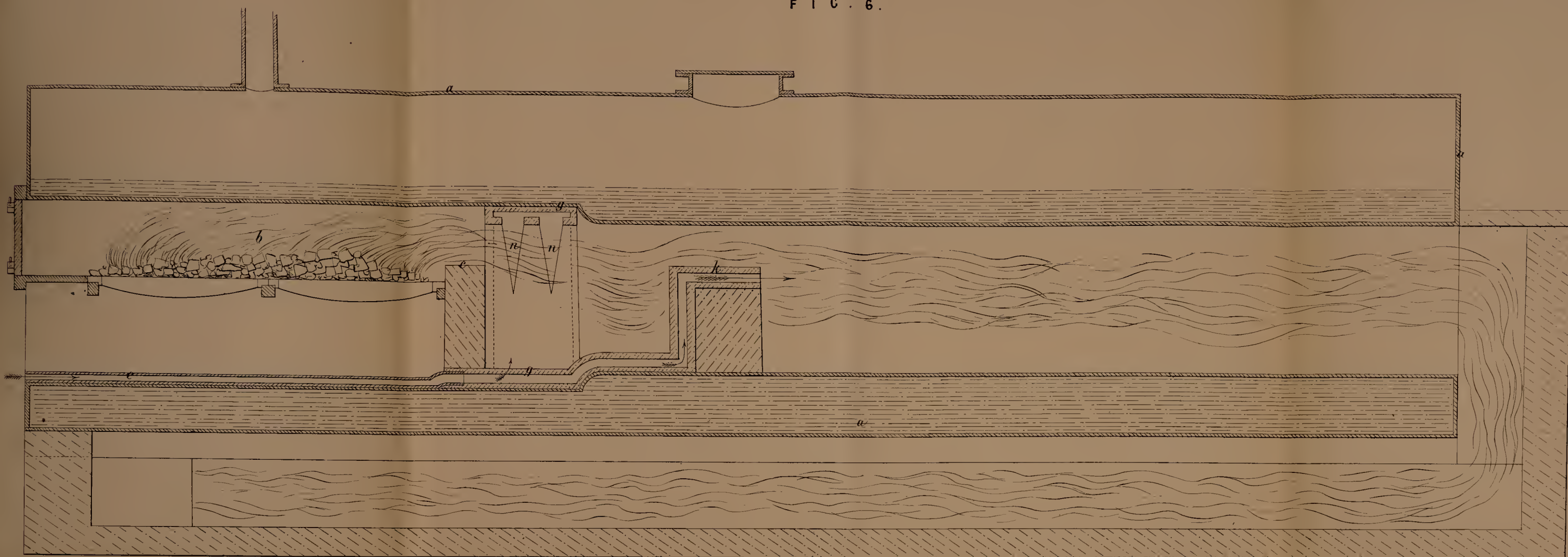
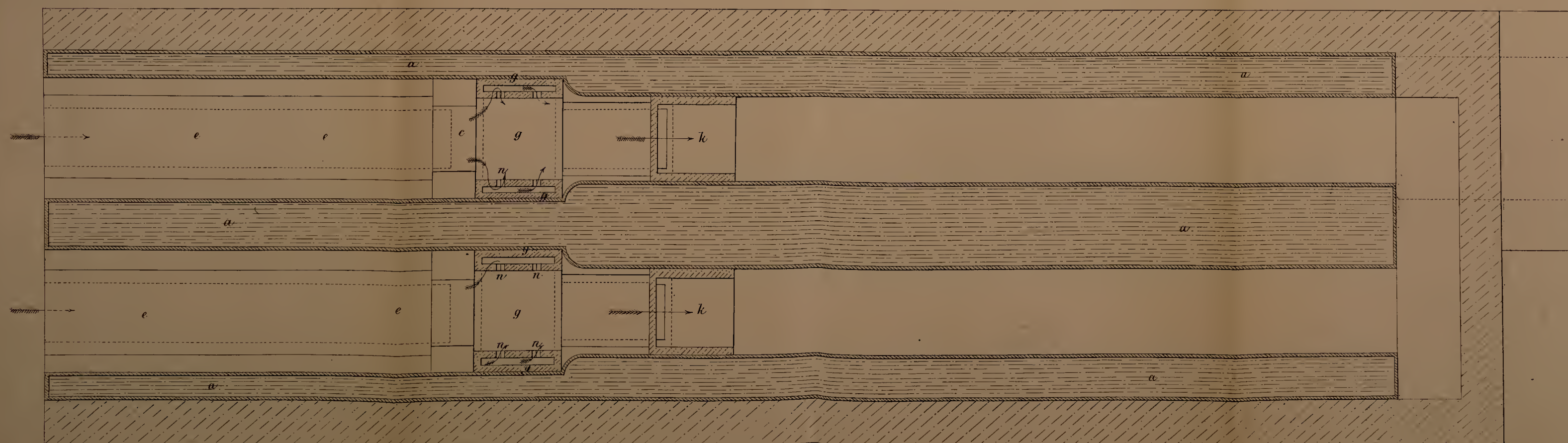
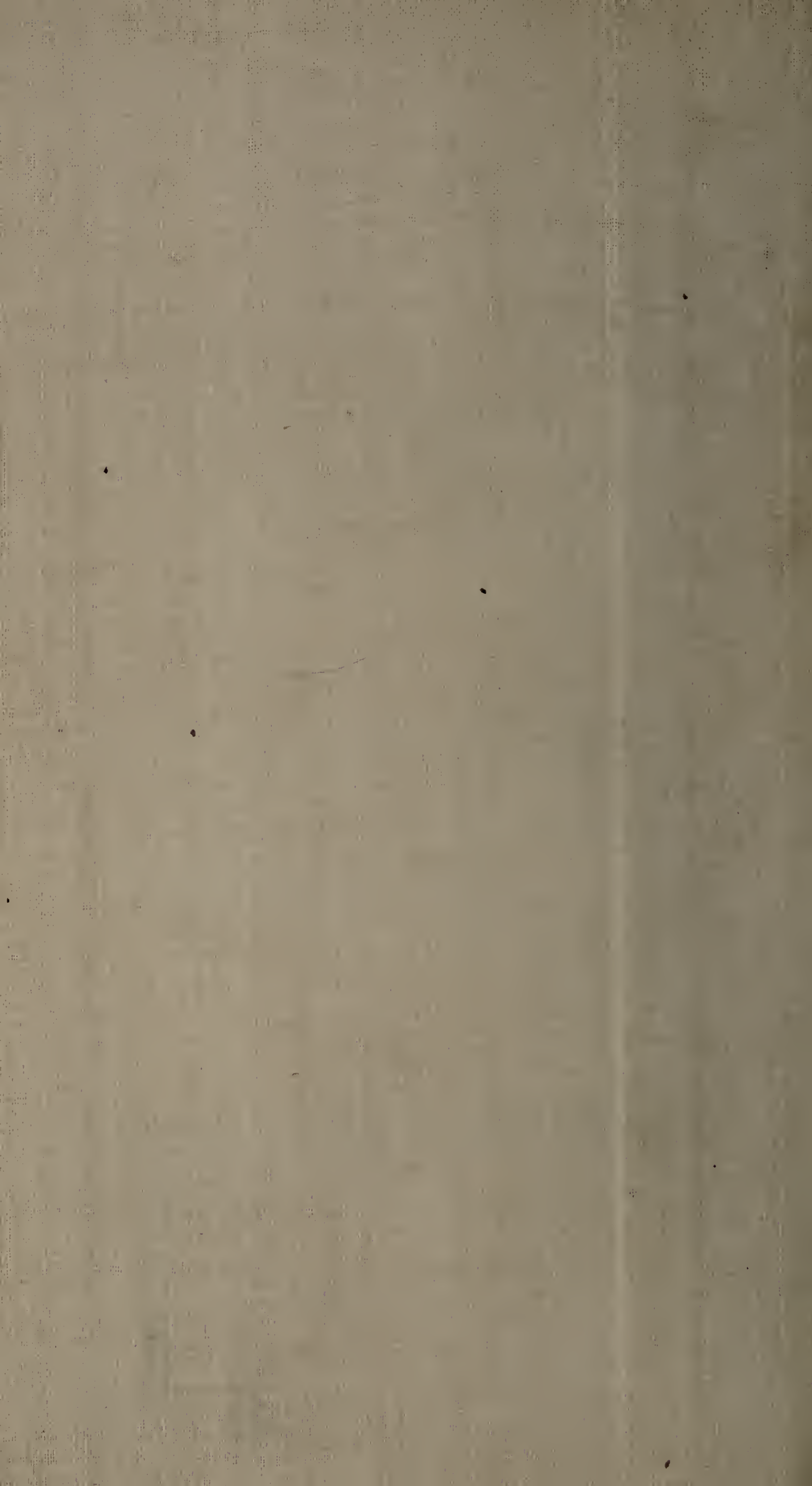


FIG. 7.



LONDON Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE.
Printers to the Queen's most Excellent Majesty. 1854.



A.D. 1849. Oct 12, N^o 12,797.
JOHNSON & CLIFFE'S SPECIFICATION

FIG. 9.

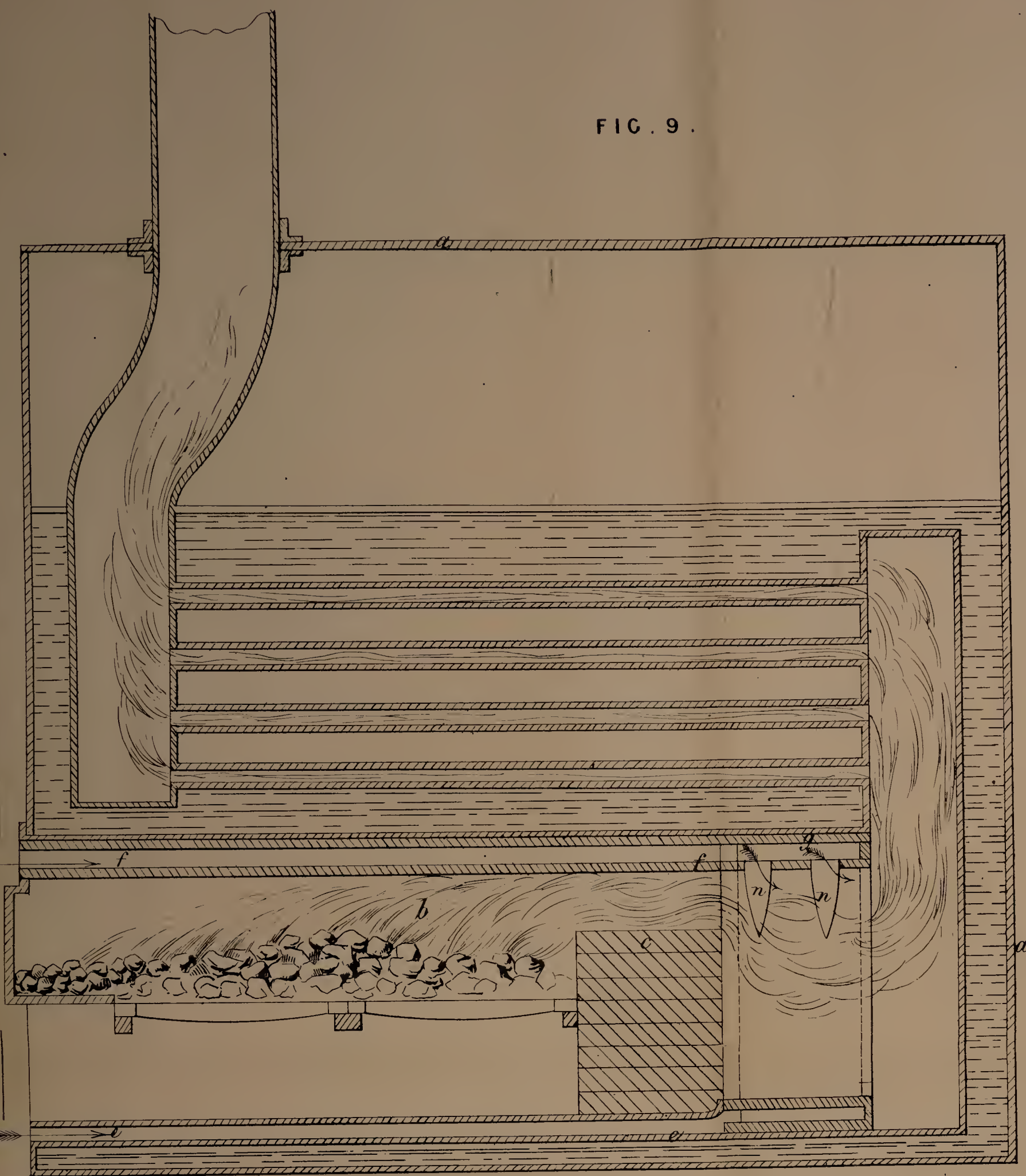


FIG. 11.

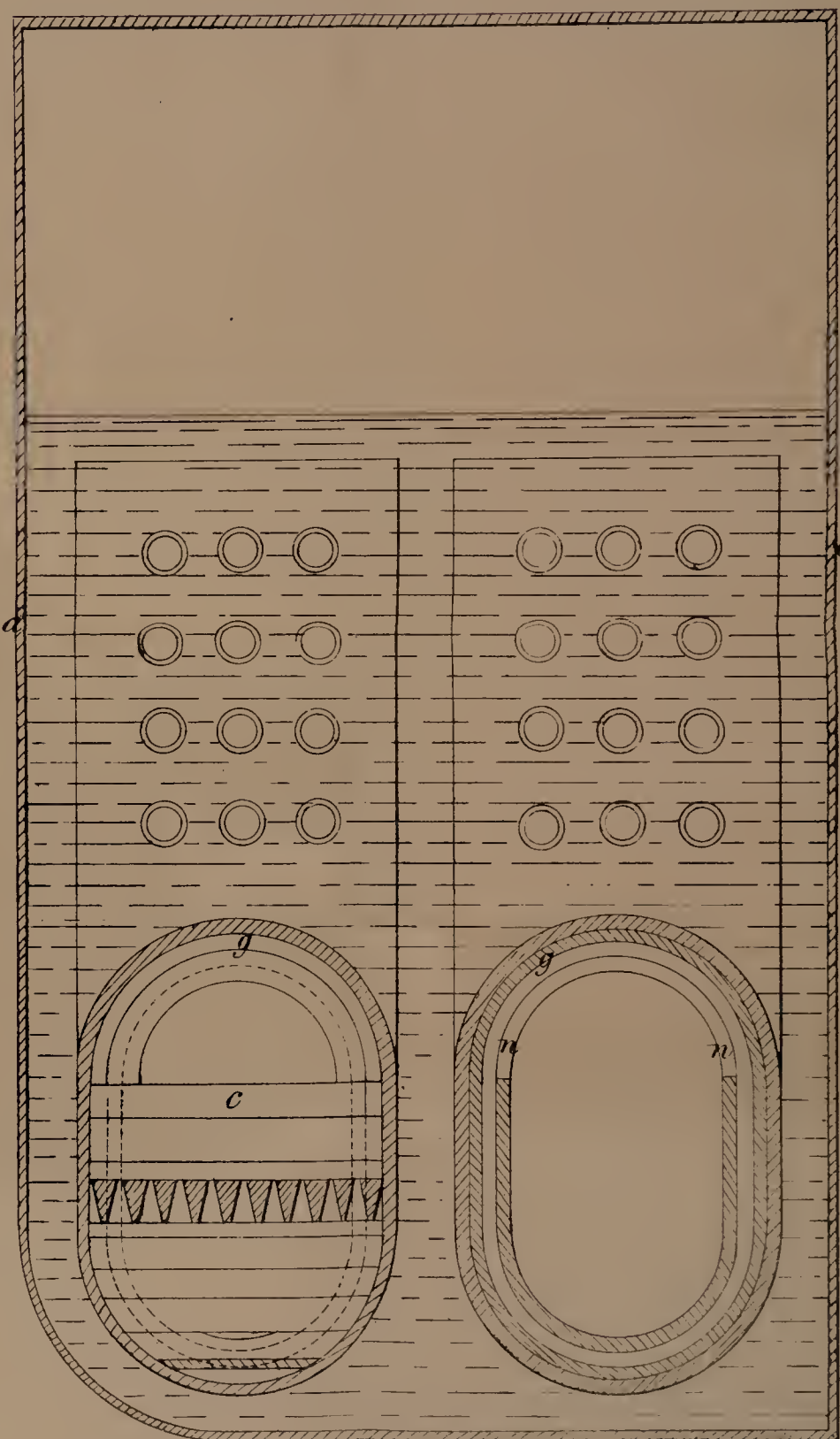
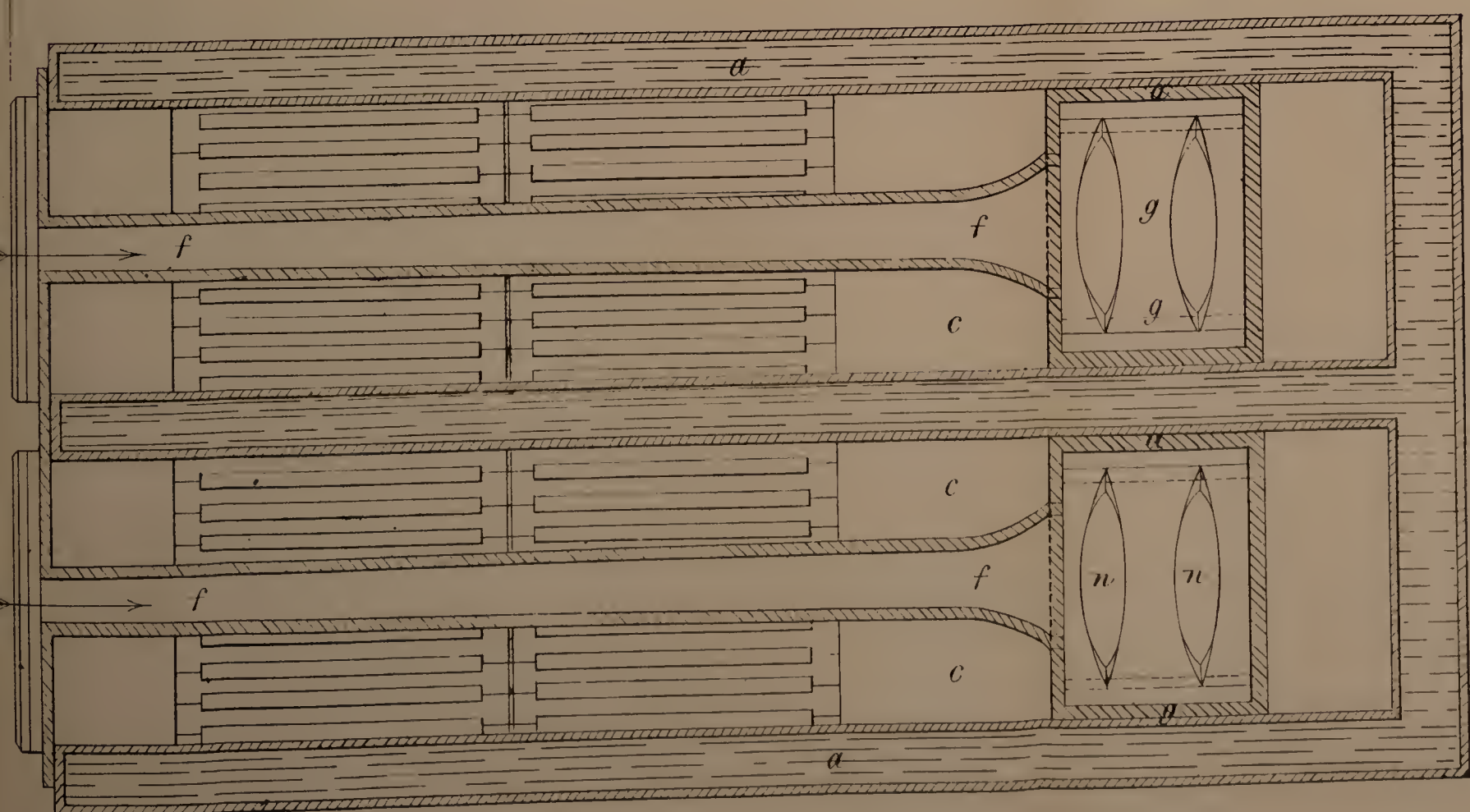


FIG. 10.



The enrolled drawing is colored

MATTHEY & SONS, LITH.

Johnson & Cliffe's Impts. in Furnaces, or in the Means of Consuming Smoke.

fire bridge by the pipe or channel *f*, which we prefer to construct of fire-clay, and attach to the under side of the boiler. This pipe or channel *f* communicates with the hollow annular space or arch *g, g*, which is furnished with holes or openings *n, n*, for the emission of the heated air among the combustible gases, 5 as already described in reference to Figures 6, 7, and 8. The atmospheric air may be admitted to the annular space or arch *g* by means of a pipe or channel *e, e*, along the bottom of the ash-pit; but we prefer the channel for the atmospheric air to be above the fire, when it can be conveniently so arranged.

Having now described our improvements and the means of carrying the same 10 into effect, we would observe, in conclusion, that although we have described the best means with which we are at present acquainted for effecting the object of our improvements and adapting the same to three different constructions of boilers, yet we do not intend to confine ourselves to the precise arrangement or construction of parts herein shewn and described, as it will be evident to an 15 intelligent engineer that they may be varied without departing from the nature and object of our Invention. We would also observe, that in order that our improvements may be properly understood, we have found it necessary to show and describe various parts which have been heretofore known and in use for similar purposes. And we wish it to be understood that we do not mean or intend 20 to claim such parts as of our Invention; but that what we consider to be new, and therefore wish to claim as the Invention secured to us by the herein-before in part recited Letters Patent, is the heating of atmospheric air by introducing it into a chamber, pipe, or hollow arch situated either immediately over the dead plate or in any other convenient situation above the fire-place, or some 25 other part of the furnace where it may be exposed to a high temperature, and conducting such heated air to a perforated hollow arch or chamber near the fire-bridge, and allowing it to issue downwards from the under side of such arch or chamber and commingle with the gaseous products of the fuel, for the purpose of supplying them with a proper quantity of oxygen at a high temperature, 30 so that the combustible gases arising from the fuel may be properly consumed and the temperature thereof not materially reduced, as has been the case in most of the plans hitherto adopted for supplying air to the combustible gases. We claim particularly the employment of the perforated hollow arch above described, whether the same be used in combination with the above arrange- 35 ments for heating the air or other plans that may be employed to effect the same purpose.

And we also claim, in combination with the above, the use of a hollow fire-bridge placed behind the ordinary fire-bridge, and perforated hollow arch or chamber, which hollow fire-bridge also receives a supply of heated air in the

Johnson & Cliffe's Impts. in Furnaces, or in the Means of Consuming Smoke.

manner above described, and discharges the same through a suitable opening, for the purpose of effecting the combustion of any of the combustibile gases which may not have been consumed by the currents of heated air from the hollow arch or chamber.

In witness whereof, we, the said Joseph Johnson and Joe Cliffe, have
hereunto set our hands and seals, this Twelfth day of April, in the
year of our Lord One thousand eight hundred and fifty.

JOSEPH (L.S.) JOHNSON.

JOE (L.S.) CLIFFE.

AND BE IT REMEMBERED, that on the Twelfth day of April, in the
year of our Lord 1850, the aforesaid Joseph Johnson and Joe Cliffe came
before our said Lady the Queen in Her Chancery, and acknowledged the
Specification aforesaid, and all and everything therein contained and specified,
in form above written. And also the Specification aforesaid was stamped
according to the tenor of the Statute made for that purpose.

DREW.

15

Enrolled the Twelfth day of April, in the year of our Lord One thousand eight hundred and fifty.

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1854.